Aerospace Drive System Finding New Applications

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The Mortorq® spiral drive system was developed by **Phillips Screw Company**, Wakefield, MA, USA, and it was introduced to the aerospace industry over five years ago. The patented recess was a perfect fit for this industry for a number of reasons. The shallow recess could be used in a screw with a head height much reduced from the standard head types that were on the market at the time. This created a fastener that weighed significantly less than previous designs, but still had the strength required for aerospace applications. The combined weight of all the fasteners in the airplane, helicopter or missile was thus reduced creating lighter assemblies.

Because the material used to manufacture aerospace fasteners is very expensive, any material savings also significantly reduce production costs. The torsional strength of each fastener is of crucial importance in the aerospace industry and each assembly must be tested in order to conform to specific national aerospace standards.

The Mortorq screw was able to meet all of these stringent requirements. It is now used for internal structural applications on commercial airlines, external skin applications on helicopters and is the only type of recess used on one government missile project. Now that the aircraft industry has proven the strength, durability and cost effectiveness of this spiral drive system, it is only natural to apply this technology to commercial, industrial and automotive applications.

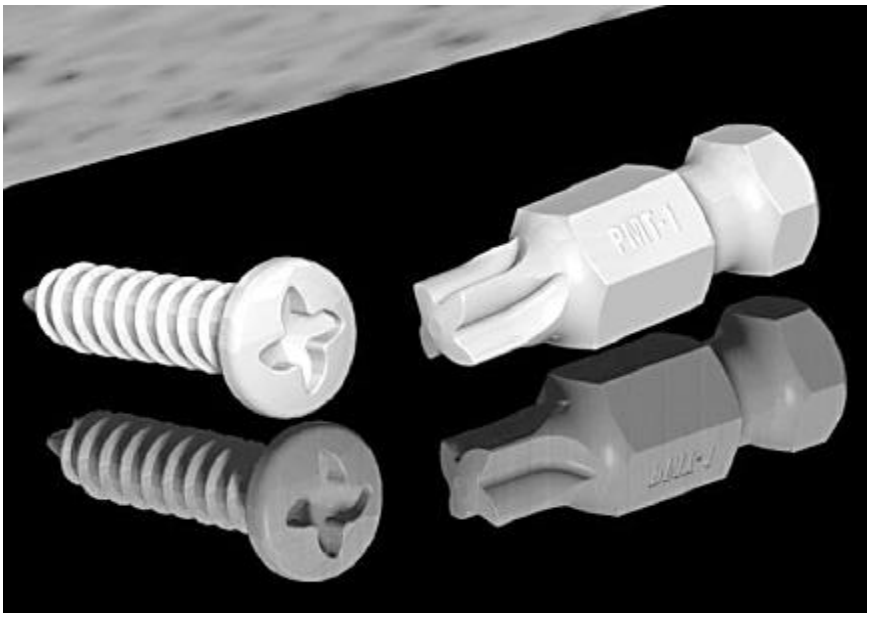
Design & Application

The ability to create an assembly that is smaller, lighter and cheaper is now at hand. Because of the reduced head height, it is now possible to use thinner materials and still hide the fastener in a shallower countersink. Without a countersunk screw, the shallower head height will create more clearance for internal parts and more design flexibility.

The unique design of the recess and driver allows for full radial contact along all four wings of the screw. When the bit is fully engaged in the recess, there is no wall contact until the driver is rotated, at which point all four walls of the bit fully contact the walls of the recess. This full-wall contact is maintained as long as there is rotational pressure and the full wall contact can be maintained in either the drive or removal directions. The open recess design allows for heavy coatings and paint buildup without affecting drivability of the screw. It also leaves room in the recess for off-angle drivability, which is helpful in hard-to-reach and hard-to-see areas.

The straight wall of the recess allows virtually all of the rotational force to be used to drive the screw. The straight walls greatly reduce the cam-out problems that are common with a conventional Phillips-type recess (cam-out is a condition where the driver bit screws itself out of the recess during the installation or removal of a fastener). Cam-outs can cause damage to visible surfaces or internal components and increase production costs dramatically or at the very least reflect poorly on the quality and workmanship of the product.

The Mortorq recess shape also has aesthetic appeal. The beauty and style of the recess can actually enhance a product design. Instead of trying to hide or cover up the exposed head of the screw, the spiral



Proven for its strength and durability in the aerospace industry, the Mortorq® spiral drive system is now finding applications in the automotive, industrial and commercial manufacturing markets.

recess can serve as an attractive alternative to a conventional screw or a plastic plug.

There are currently ten recess sizes available. The smallest, PMT-000, can be used in screws with head diameters as small as 0.100" (2.5 mm) and the largest recess, PMT-7, can be used in screws with a head diameter in excess of 1.375" (35 mm). The six-lobe competition requires nearly twice as many recess sizes to cover this same range of screw variations.

Quality Assurance

The Mortorq spiral drive system is a licensed product of the Phillips Screw Company and as such is controlled by Phillips Screw Company. The punches, bits and screws must first be inspected and approved by Phillips Screw before they are cleared for production. Additionally, all licensees must submit samples on a regular basis to ensure that the strict quality standards are maintained.

The design of the punches, bits and screws is accomplished using the latest solid modeling techniques. In order to maintain a consistent product, files created at Phillips Screw are sent to all of our bit and punch manufacturers so that the same wing profile is reproduced by all our vendors. This eliminates any misinterpretation of the design prints and ensures consistent products from vendor-to-vendor.

Phillips Screw has also developed a series of gages for each recess size. All Mortorq gages are purchased and inspected by Phillips Screw as part of its quality assurance program. They are then distributed to the appropriate vendors.

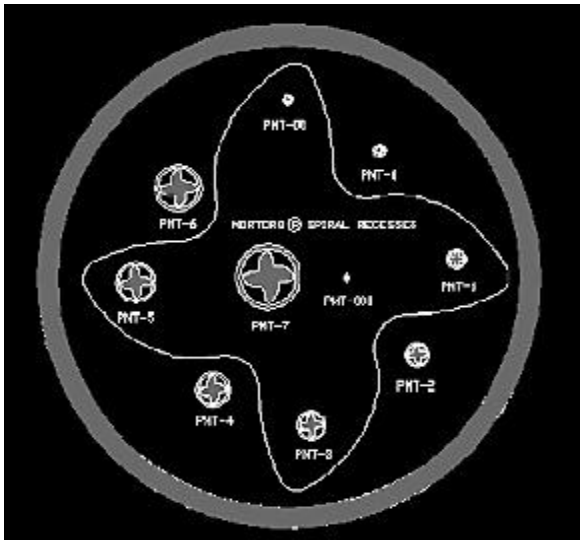
Each bit manufacturer has GO and NO-GO gages to check for functional fit and torque test blocks to test the torsional strength of the bits.

The punch manufacturer receives a series of GO and NO-GO plug gages for functional fit and a penetration gage for each size to ensure that the depth of the recess is to specification.

In addition to the GO and NO-GO gages and the penetration gages, the screw manufacturer must also check the fall-away with a special gage to make sure that the Mortorq recess has the straight walls necessary for a good drive system.

Conclusion

The Mortorq spiral drive system has proven its strength and durability in the aerospace industry and is now taking off at ground level. All of the advantages of this recess, (strength, compact head size, material and cost savings, open recess design to accommodate heavy coatings or paint buildup, off-angle driving ability, anti-cam-out properties, full wing contact and stringent quality control) can be applied to any industry to improve on its older designs and to incorporate into its new designs.



Computer simulation showing the various Mortorq® recess sizes offered by the Phillips Screw Company.

The functionality of the recess was obvious to the aerospace industry, however the beauty and style of the recess is something that the aerospace industry has overlooked. Opportunity is knocking. Now is the time to take advantage of all of the Mortorq spiral drive system benefits.

To receive additional product specifications on the Mortorq spiral drive system, contact the author or **Circle 202.**

More on Phillips Screw Company...

Phillips Screw Company developed Phillips®, Phillips Square-Driv®, ACR® Phillips II®, Torq-Set®, Tri-Wing®, posidriv® and Mortorq® screws, drivers and related fastener products. The company's fastener products are licensed to manufacturers who have agreed to maintain the drive system specifications and standards of quality established by the Phillips Screw Company.

Phillips controls and maintains detailed and active monitoring programs to test consistency in the quality of the products made by its licensees. Licensees are periodically required to submit production samples to Phillips for conformance testing to technical specifications and quality standards.